Water Equipment & Policy
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Environmental microbiology research focuses on creating sustainable drinking water/wastewater treatment systems

Dr. Brooke Mayer
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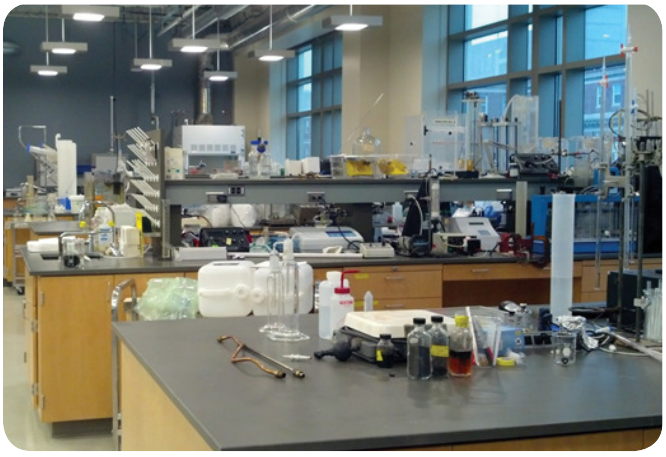
Dr. Brooke Mayer is currently an Assistant Professor in the Department of Civil, Construction and Environmental Engineering at Marquette University. She graduated from the Environmental Engineering program at Arizona State University (ASU) with her B.S. in 2004, M.S. in 2006, and Ph.D. in 2008. Her graduate work was partially supported by the Department of Homeland Security, Environmental Protection Agency, and the National Science Foundation, and included a research internship with Pacific Northwest National Laboratory. She joined the ASU faculty of Sustainable Engineering and the Built Environment as a lecturer before coming to Marquette University in 2012.

Dr. Mayer's Water Microbiology Research Team



Dr. Mayer's research interests primarily relate to sustainable drinking water/wastewater treatment and environmental microbiology. This work applies fundamental physical, chemical, and biological principles to establish more efficient detection and sustainable treatment methods for water/wastewater contamination. In the Water Quality Lab at Marquette University, the Mayer research group is able to detect and quantify chemical contaminants (e.g., phosphorus, nitrogen, and dissolved organic species) as well as microbial contaminants (e.g., pathogenic viruses and bacteria). The lab is also equipped with bench-scale experimental equipment for evaluating UV disinfection, UV advanced oxidation, column adsorption studies, etc. The group is also able to perform quantitative sustainability analyses such as life cycle assessments.

Recent research projects include:

- Assessment of the removal and inactivation of emerging viruses using enhanced coagulation and ultraviolet disinfection
- Development and validation of new techniques for detecting and quantifying infectious waterborne viruses
- Use of titanium dioxide photocatalysis to target mitigation of disinfection byproducts
- Identification and evaluation of novel techniques for the removal and recovery of phosphorus from water and wastewater

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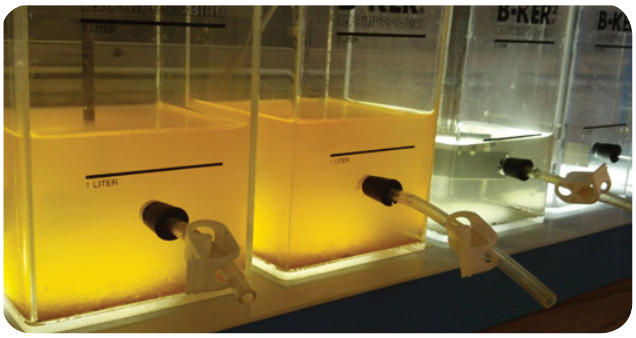
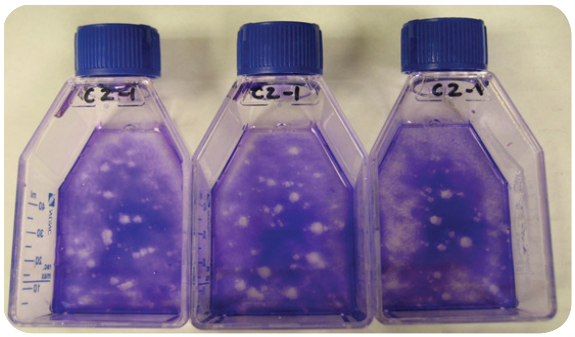
Several current projects focus on the removal and recovery of nutrients from water and wastewater. This includes the design and test of a nutrient capture and recovery system using ion exchange followed by struvite precipitation. Additionally, the group is testing the potential of the advanced oxidation process titanium dioxide photocatalysis for the conversion of organic phosphorus into the more readily removable inorganic species. These efforts contribute to satisfying increasingly stringent environmental nutrient requirements.



Jar tests using ferric chloride coagulant to target removal of organics



Plaque assays to detect and quantify infectious coxsackieviruses in water before and after treatment

Representative journal publications:

1. Mayer, B.K.; Gerrity, D.; Rittmann, B.E.; Reisinger, D.; Brandt-Williams, S. 2013. Innovative strategies to achieve low total phosphorus concentrations in high water flows. Crit. Rev. Environ. Sci. Tech. 43:4:409-441.
2. Rittmann, B.E.; Mayer, B.K.; Westerhoff, P.; Edwards, M. 2011. Capturing the lost phosphorus. Chemosphere.84:846-853.
3. Mayer, B.K.; Ryu, H.; Gerrity, D.; Abbaszadegan, M. 2010. Development of an integrated cell culture-qRTPCR assay for simultaneous quantification of coxsackieviruses, echoviruses, and polioviruses in disinfection studies. Water Sci. Technol. 6:2:375-387.
4. Gerrity, D.; Mayer, B.K.; Ryu, H.; Crittenden, J.; Abbaszadegan, M. 2009. A comparison of pilot-scale photocatalysis and enhanced coagulation for disinfection byproduct mitigation. Water Res. 43:6:1597-1610.
5. Ryu, H.; Mayer, B.K.; Abbaszadegan, M. 2009. Applicability of quantitative PCR for the determination of removal efficacy of enteric viruses and Cryptosporidium by water treatment processes. J. Water Health. 8:1:101-108.
6. Mayer, B.K.; Ryu, H.; Abbaszadegan, M. 2008. Treatability of USEPA Contaminant Candidate List viruses: removal of coxsackievirus and echovirus using enhanced coagulation. Env. Sci. Technol. 42:18:6890-6896.
7. Abbaszadegan, M.; Mayer, B.K.; Ryu, H.; Nwachuku, N. 2007. Efficacy of removal of CCL viruses under enhanced coagulation conditions. Env. Sci. Technol. 41:3:971-977.
8. Straub, T.M.; Höner zu Bentrop, K.; Orosz-Coghlan, P.; Dohnalkova, A.; Mayer, B.K.; Bartholomew, R.A.; Valdez, C.O.; Bruckner-Lea, C.J.; Gerba, C.P.; Abbaszadegan, M.; Nickerson, C.A. 2007. In-vitro cell culture infectivity assay for human noroviruses. Emerg. Infect. Dis. 13:3:396-403.

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